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Electrical machine, in particular a three-phase generator without slip rings

Prior art

The invention is based on an electrical machine, in particular a three-phase generator without slip rings according to the type of claim 1. When known
5 electrical machines of this kind are fitted in a cross-country vehicle in particular and this is capable of also moving through water, it is possible for moisture to enter the generator, which causes it to fail. The vehicle is then no longer in running order.

10 Advantages of the invention

In contrast, the electrical machine according to the invention, as characterised in claim 1, has the advantage of being impenetrable to moisture through appropriate
15 measures, even if the vehicle carrying it is soaked through, i.e. the generator lies below the surface of the water. This property is also called fording ability. The measures which this requires entail relatively little expenditure.

Further advantages of the invention will emerge from the subclaims, the following description and the drawings.

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Drawings

Figure 1 of the drawings is a section through a three-phase generator without slip
rings.

25 Figure 2 is a plan view onto the end shield of the generator,
Figure 3 is a section through a detail at the drive end shield,

Figure 4 is a side view in the direction of the arrow according to Figure 2.

Description of the embodiment

5 The three-phase generator according to Figure 1 of conducting piece rotor type has a housing consisting of an approximately pot-shaped housing part 10, which is closed by an end shield 11 - which is also called a negative heat sink for negative diodes, which are disposed on this, of a rectifier unit. A ball bearing 13 is disposed in a shouldered bore 12 formed in the end shield 11, while a further ball bearing
10 16 is seated coaxially with the bearing 13 in a convex part 15 moulded onto the housing pot 10. The shaft 18 of a pole wheel 19 (claw-pole rotor), which is integral with it, is mounted in the two ball bearings. Projecting out of the end shield 11 is a tapered shaft end 18A of the shaft 18, to which a belt pulley 20 for driving the generator is secured.

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The generator is of the conventional type, comprising a stator core 22, a pole body 23 with a stationary exciting winding 24, and a rotating conducting piece 26, which is firmly connected to the pole wheel 19 via a non-magnetic ring 25.

20 Air gaps between the above-mentioned parts are not designated in detail, as these are conventional and not essential for the invention.

A so-called positive heat sink 28 for the positive diodes of the rectifier unit is secured by screws 29 to the end shield 11 coaxially with the latter. An insulating
25 sheet 30 lies between the two parts. The heads 29A of the screws 29 point outwards, i.e. towards the belt pulley. A connection plate 32 is located radially within the heat sink 28, again also coaxially with the latter, and is secured to the end shield 11 by cheese-head screws 33, i.e. the heads of the cheese-head screws

also point outwards. The parts mentioned last are located under a protective cap 34, the inside diameter of which embraces a plate 35, while its outside diameter engages in an annular groove 37 in the end shield 11. This is considered in detail in the following. However there will firstly be a discussion of Figures 2 and 4, which represent the end shield 11, in a plan view in Figure 2 and in a side view in Figure 4 (direction of arrow G in Figure 2). The regulator housing is designated by 40. This has a plug base 42 and a pressure equalising duct 41 - see Figure 4 - which connects the interior space of the generator on the outside to a cable harness, which is not shown, inserted in the plug base 42 and also used for pressure equalisation. The plug, which is not shown either, seals the plug connection at the plug base 42. The purpose of this arrangement is discussed in the following, although several important details are to be described beforehand.

As initially mentioned, a vehicle provided with the generator according to the invention may get into situations, for example when crossing a body of water, in which the generator lies below the surface of the water. The above-mentioned pressure equalisation prevents the occurrence of an underpressure in the generator due to temperature changes, so that no corrosion products can enter the generator. An arrangement of this kind is called fording ability. In this case pressure equalisation takes place via the air volume in the cable harness through the pressure equalising duct 41 into the interior space of the protective cap 34 and via bores in the end shield for passing connections through to the interior space of the generator.

However only a few further measures are required to prevent liquid from entering the generator, these relating to the sealing of the generator housing interior. For this purpose it is important for the protective cap 34 to be sealed off from the end shield 11. This is effected by providing a seal 44 in the groove 37, in which a rim

45 extending round the outer circumference of the protective cap 34 engages. Also important is the seal 49 at the outer race of the ball bearing 13 between the plate 35 and the end shield 11 and seals 56 at the regulator housing. A sealing ring 53, which seals off the generator housing towards the internal combustion engine side, also lies in an annular groove 52 at an outer flange 51 of the housing 10. It was therefore considered important to systematically seal all the generator parts against the penetration of liquid. The above-mentioned pressure fluctuations in the generator due to temperature changes, i.e. when the vehicle enters the water with the generator and is cooled, and the pressure fluctuations which this causes necessitate pressure equalisation which - as mentioned above - takes place through the pressure equalising duct 41 in the regulator housing 40 and through the cable harness.

Figures 2 and 3 will also be discussed for the sake of completeness, Figure 2 also showing the sealing means 55 between the end shield 11 and the protective cap 34, sealing means 56 at the regulator housing 40 and sealing means 57 at an anti-interference capacitor 59, which is not shown in detail. The rear ball bearing 16 is mounted in the stator housing 10 via a fitting ring 58. The plate 35 at the front bearing 13 is secured to the end shield 11 by countersunk screws 61. It is sealed by seals 60 according to Figure 3.

CLAIMS

1. Electrical machine, in particular a three-phase generator without slip rings of the conducting piece rotor type with a stationary exciting winding (24) and a pole wheel (19) which is connected to the drive shaft (18, 18A) and has a preferably integral conducting piece (26), wherein the drive shaft is mounted on both sides in ball bearings (13, 16) which are disposed in the generator housing (10, 11), one of which in the end shield (11) on the drive side, which serves as a so-called negative heat sink, to the outside of which a so-called positive heat sink (28) of a rectifier unit with its negative and positive diodes is secured, as well as a connection plate (32) screwed to the outside of the end shield (11), wherein a regulator (39), which is provided with a plug base (42), for regulating the generator is disposed on the outside of the end shield (11) and these parts are surrounded by a protective cap (34) secured to the end shield, characterised in that the protective cap (34) is connected in a watertight manner via sealing means to the end shield (11), and that a pressure equalising duct (41), which extends into the space of the protective cap (34), is formed in the plug base (42) of the regulator (39).
2. Machine according to claim 1, characterised in that the protective cap (34) has an annular collar (45) which projects into an annular groove (37) in the end shield (11) and is surrounded all round and on both sides by a sealant (44).
3. Machine according to one of claims 1 and 2, characterised in that the ball bearing (13) and the end shield (11) are sealed off from a plate (35), which is embraced in a sealing manner by the protective cap (34), by sealing means (49).

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4. Machine according to one of claims 1 to 3, characterised in that pressure equalisation in the generator is effected through the pressure equalising duct (41) at the plug base (42) of the regulator (39) via a cable harness hose of an appropriate length which is to be mounted at this point and leads to the outside.

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5. Machine according to one of claims 1 to 4, characterised in that it is liquid-cooled.

6. Machine according to one of claims 1 to 5, characterised in that a sealing ring (53) is disposed in an annular groove (52) at an outer flange (51) of the housing pot (10) of the generator, which ring seals off the generator from the internal combustion engine when it is fitted to the latter.

7. An electrical machine substantially as herein described with reference to the accompanying drawings.



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Claims searched: 1-6

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Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.Q): H2A (AKB2, AKB4B, AKT5)

Int Cl (Ed.6): H02K (5/10, 5/12, 5/132)

Other: ONLINE: WPIL, JAPIO, IFIPAT.

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
	NONE	

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.